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Remarks by G. Ignatieff, Representative of Canada at Informal Meeting on CTB, Wednesday, 13 August 1969

INTRODUCTION

In leading off today's informal meeting on the subject of a Comprehensive Test Ban, I should perhaps begin by outlining the reasons for the Canadian decision to call for this session. Delegates will remember that on 23 May I submitted to the Committee a Working Paper on seismic exchanges (ENDC/251). At that time, I pointed out that General Assembly resolution 2455 (XXIII) requested this Committee to take up "as a matter of urgency" the elaboration of a treaty banning underground nuclear weapon tests; no wonder, since, as everyone knows, there is nothing more symptomatic of the continuation of the nuclear arms race than the continuation of testing of nuclear weapons. As the time is fast approaching when the Committee must prepare its usual report to the UNGA making an accounting of just what has been accomplished at this 1969 session in response to the Assembly's resolution, the Canadian delegation is of the opinion that steps must be taken which would permit the report to demonstrate some progress in this critical area. Our Working Paper outlined what we considered would represent a minimal degree of progress--agreement to issue a call for essential data on seismic exchanges which would be a prerequisite for any more effective exchange mechanism.

We recognize that we are not alone in our desire to effect progress in this field. The delegations of Sweden, the United Kingdom, Ethiopia and Japan have all, during the current or previous session of the Committee, advanced various ideas regarding more effective exchanges of information. We consider that the proposals put forward in our Working Paper might therefore receive the support of other interested delegations, and it is our hope that by convening this informal session, we may help pave the way to define some common purposes in this important area.

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It is the belief of the Canadian delegation that, before specific machinery can be considered for any worldwide seismological data exchange, clarification is required on the extent of co-operation which governments would be prepared to extend and the form in which seismic information might be made available.

Our Working Paper addressed itself to this specific aspect of the seismological exchange proposal on the assumption that the problems of verifying any Comprehensive Test Ban would decrease provided an exchange of original seismological data could be assured. We recognize, however, that there is a definite relationship between any Comprehensive Test Ban and progress in the USA/USSR bilateral negotiations on the limitation of strategic weapon vehicles.

As I said in my remarks at the 424th meeting of this Committee on 31 July, if we are to make progress "in the first instance we have to seek common purposes on each issue before trying to agree on language". It is our hope in this informal meeting that with the help of the experts present, through the process of questions and answers we will find certain aims in common which will be useful both from a scientific as well as from an arms control standpoint (and perhaps it is well to bear in mind that the less inexact the questions, the less inexact the answers are likely to be.)

I would hope that in our discussions today we might clarify the technical aspects of the role of seismological exchanges in any verification proposals, keeping in mind that progress in the political field is, of course, basic to the eventual negotiation of a complete test ban. We are, moreover, hopeful that this meeting will help to crystallize the informal expressions of interest--and for that matter, support--which have so far come to our attention. I cannot conceal from you, and I think we are probably on common ground here, that my main concern is to try to ensure that some progress may be reflected in our UNGA report. I hope, therefore, that the results of this morning's discussions will give us all some guidance on the most useful course to pursue with this consideration in mind.

In order to assist the Committee in understanding fully the Canadian proposal outlined in our Working Paper, we have arranged for a senior Canadian seismologist, Dr. Kenneth Whitham, to be present for these informal discussions. With your permission, therefore, I propose now to ask Dr. Whitham to offer some explanation of the technical aspects of the Canadian proposal. I would further suggest that, after an opportunity has been provided for the observations of any other delegations, Dr. Whitham would be willing to answer questions on this subject, insofar as specific answers can be provided at this stage in the development of Canadian capabilities in this field

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Remarks by Dr. K. Whitham at the Informal Meeting on CTB
13 August 1969

It appears self-evident that the effectiveness of seismological verification of a comprehensive test ban is a major issue before this Committee. The discussions here indicate that there is, as yet, no agreement between the different powers about the national security risks involved for them in the event of their acceptance of any one of the different proposals introduced from time to time in this Committee. The only clear agreement apparent at this time is that improvements in seismological verification must help to hasten an acceptable test ban, and that, as the SIPRI Report indicates, remarkable improvements in seismological verification have been developed by the seismologists of the world in the last decade.

As the Canadian representative stated at the 404th Plenary Meeting of the ENDC on 17 April 1969, in seismology there has been a long tradition of informal international co-operation in the study of earthquakes, between scientists and institutions in many different countries, both bilaterally and multilaterally through existing international and regional seismic centres. This exchange has covered abstracted information from seismic records, the seismic records themselves and the results of scientific analysis, and in general these exchanges on earthquakes for humanitarian and scientific purposes have been restricted by economic rather than political factors. This international co-operation is to everyone's mutual benefit since the seismological waves from earthquakes travel through the earth without respect for national frontiers.

I would like to remind this Committee that the seismic waves generated by underground nuclear explosions also do not recognize national frontiers.

We believe that the problems in seismological verification of a test ban, whether complete or of a threshold nature, would decrease if guaranteed access to all original seismological data could be assured. The reason is simply that it is necessary both to detect and identify underground nuclear explosions against the background of natural earthquakes, and both the detection and identification problems are simplified with widespread data including data at regional distances from the shot point. By simplification, I mean that the seismological detection and identification can be made increasingly effective for lower and lower yield explosions, as increasing and more nearby data is made available. In particular, the method of identification which depends upon the partition of the energy between long and short periods being different for an underground explosion and for a natural earthquake can only be applied if the principle works for the yields of interest and if the detection capability for the long and short period waves exists to apply the identification criteria. The guaranteed availability of seismic data will enhance research on the validity of the method at lower yields, about which there is as yet no universal technical agreement for explosions with body wave magnitude below perhaps 4 1/2 to 4 3/4. It will also immediately increase the area of the earth adequately covered by this technique at any calculable magnitude such as, for example, explosions with a body wave magnitude 5. It should then be possible for technical advisers to estimate the effectiveness of verification for any and all regions, which effectiveness must depend upon what data governments will make available.

I should like to give an example. For underground nuclear explosions at the Nevada Test Site, using data from the Canadian standard network, we have published results which we believe unequivocally demonstrate that for this combination of test site and observing stations, the identification method mentioned above works down to explosions with an equivalent body wave magnitude 4.5, that is to say for explosions of about 5 to 10 kiloton yield in hard rock. Unfortunately, and this is most important, by this magnitude we are at the limit of capability of detection of the long period signals with our standard seismic network and therefore although we believe we have

proved that the method works and might indeed work at even lower magnitudes, we know that we have a rapidly falling possibility of detecting the long period signals and that at some magnitude range, which is above the 4.5 lower limit I have quoted above, our probability of being able to apply the method is not high. Now, if we apply the same technique to some presumed underground nuclear explosions in Central Asia, we find for this new combination that we have no detection capability for the long period waves using the Canadian network below explosions with a body wave magnitude of about 5.9, i.e., about 200 kiloton yield in hard rock. The difference is essentially, we believe, produced by the increasing distance between the stations and the shot point, the fact that for the second example given above the long period waves cross two ocean-continent boundaries, and that certain other natural peculiarities involving the structure of the outer layers of the earth favour the first combination. We know, and work published in the SIPRI Report confirms this, that seismic data is obtained at the present time at closer distances to the Asian test site than Canada and the amount of data already freely available allows a considerable reduction in the body wave magnitude 5.9 figure quoted above for the Canadian network alone looking at this site. The exact amount of the reduction depends upon the location and instrumentation at the seismic stations and the usefulness of the criterion in verification for this site depends upon which data would be guaranteed available. These sorts of arguments with different but calculable numbers could be applied in reverse by, for example, an Asian country in seeking to monitor the Nevada Test Site.

Before finding acceptable economic and technical means to ensure the worldwide availability of seismic data, it seems to us that the first step is to clarify what seismic information governments would make available, in what form and with what delays. We believe that the answers to these questions are directly relevant to the possibilities of coming to an agreement about a test ban which is the direct concern of this Committee. We further believe that such a clarification will increase the possibility of smaller countries being able to make their own technical assessment of some of the different problems involved and enable some of them to contribute usefully, through this forum and elsewhere, to this vital debate.

We do not hold fixed views about the mechanism of such a data exchange. We are aware that, at one extreme, a world depositary of data could be envisaged perhaps, but not necessarily, as an extension of one of the already existing international centres for seismology. In this respect we are also aware that the international seismological community and UNESCO are discussing at present the needs, problems and economics of one such centre at Edinburgh. We believe that no centre is equipped at the present time to act effectively as a worldwide seismic data archive, but one could conceivably so become if this were the wish of the international community. We are also not forgetting that a major international archival service would produce considerable advantages for the science of seismology in general.

At the other extreme we can envisage the situation where access to guaranteed data is required by only a few countries for a limited number of stations for a limited number of events only and both these may vary according to the particular national requirement. We consider that at this extreme of demand, it is unlikely that a seismological centre for this purpose need be established or developed.

With respect to the delays inherent in the supply of copies of the original data or the original data themselves, we would express the hope that these could be minimized. It is my personal opinion that a matter of some weeks would be the order of time interval which any country or international body, if one were so created, would require to assess the situation created if a concealed test were suspected or claimed, and if verification in a treaty situation depended on a seismological decision. This interval of time appears to us to be entirely compatible with the time framework within which the seismic networks could distribute copies of data without excessive expense and effort on their part. In making our proposal, we invite the views of the member states and in particular those of countries which operate the larger seismic networks. The guaranteed availability of seismic data without archival deposition would merely formalize existing international practice for earthquakes without further extensive costs to co-operating countries. However, our proposal would extend existing practice to cover explosions and events which any nation considered suspicious and would give governmental assurances of the availability of the data on request from those stations listed.

The technical data listed in the Canadian proposal is not in any way different from that which would normally be supplied by any scientist or institution to another with record copies for purposes of earthquake research.

We regard this modest proposal as a first and logical step in any process whereby the seismologists of the world can help the essentially political decision-making processes and provide the best guide for them.